CHAPTER 12

RIGHT-OF-WAY FENCING

Introduction

Under certain conditions Right-of-Way fence is specified on projects at various locations. It is the policy for instance to place Right-of-Way fences along limited controlled access highways for the purpose of denying access to the highway except at designated locations. Therefore it is important that the Certified Technician be familiar with the types of fencing, materials, placement procedures, and basis of payment that are required by INDOT.

Types

Right-of-Way fencing normally consists of six types:

* Farm Field Type Fence (F.F.T.F.)
* Chain Link Type Fence (C.L.T.F.)
* Barbed Wire Type Fence
* Temporary Fence
* Reset Fence
* Gates

F.F.T.F. is the most commonly used and consists of a woven wire fabric. Often known as Farm Fence, F.F.T.F. is used in agricultural or non-residential areas.

C.L.T.F. is used in residential, industrial, or commercial areas. It is also used in areas with a high concentration of people. For example: C.L.T.F. is used in rest areas around sewage treatment plants and between the rest area and the roadway. C.L.T.F. consists of a woven wire fabric sometimes known as industrial fence.

Barbed wire type fence is hardly ever used. It basically consists of 2 strands of barbed wire on "T" posts. Barbed wire fence is detailed on Standard sheet 603-FFTF-03. The posts are placed similar to F.F.T.F. except for post spacing. Since it is seldom used it will not be discussed in detail.

Temporary fence is used as named - Temporary. On portions of a contract where fence is required on the right-of-way, the required permanent fence should be erected and maintained at locations where the property owner desires to use the adjacent area for pasture for livestock. If the permanent fence has not been erected by the time the adjacent property owner desires to use the pasture, a temporary fence shall be erected and maintained. The temporary fence should be sufficient to

(cont'd) prevent the livestock from entering the right-of-way. Temporary fence is not paid for unless it is a bid item in the contract. If the temporary fence is a pay item, it will be measured and paid for by the linear foot.

Resetting fence consists of:

* The removal of an existing fence within the limits of a new improvement.
* Storing it carefully.
* Resetting it when and where shown on the plans.

Resetting is to be completed as if it were new fence. I.E. If it is F.F.T.F. then it should be placed in the same manner as new F.F.T.F. The replacement of damaged or missing parts, including posts, is included in resetting. Reset fence is paid for at the contract unit price per linear foot.

Since reset fence and temporary fence have the same characteristics as F.F.T.F. or C.L.T.F., they will not be addressed further.

Gates are infrequently used in INDOT work. Gates are hardly ever used in a right-of-way fence that represents a property line. They are used in internal fences. Internal fences are those located within the right-of-way. For example, a C.L.T.F. around a rest area sewage treatment plant is an internal fence. Gates are used to give access to such an area so that maintenance activities can be accomplished. Gates of this nature are of the same woven fabric as the fencing it interrupts. I.E. If C.L.T.F. is being used then C.L.T.F. fabric is used on the gate.

Materials & Placement of F.F.T.F.

There are basically seven individual parts to F.F.T.F. Standard Sheet 603-FFTF-01 details the parts. They are:

* End, Corner, or Pull Posts
* Diagonal Braces
* Line Posts
* Woven Wire Fabric
* Barbed Wire
* Concrete
* Fasteners

F.F.T.F. Posts

End, corner or pull posts are made of galvanized or aluminum coated tubular steel. These tubular steel posts have a diameter of 2 inches, a weight of 3.65

#/Lft., and a length of 7 feet. These posts act as an anchoring device for the fence fabric and barbed wire. An end post is the post at the beginning end of a run of fence. It is characterized by having only one brace and fence leaving it in one direction. A corner post is a post that is placed at locations in which there is a horizontal change in the property line (R/W). A change of direction with an angle of 10 degrees or more requires a corner post. Pull post is an intermediate post in between an end post and a corner post. Pull posts should be placed no farther than 500 foot intervals in straight runs and at each vertical angle point of 10 degrees or more.

Because end, corner, and pull posts are anchoring devices, they are placed in concrete. The concrete can be either Class A or B. The concrete and post are placed in a drilled hole with a diameter of 1 foot and a depth of 36 inches. The post should extend into the concrete 2'-6" and be at the required grade and alignment.

All end, corner, and pull posts shall be fitted with caps to exclude moisture.

Diagonal Braces

Diagonal braces are placed at all end, corner, and pull posts. The purpose of the diagonal brace is to counteract the pulling force of the wire fabric on the end, corner, or pull post...thus keeping the end, corner, or pull post in alignment. Diagonal braces are made of galvanized tubular steel with a diameter of 1 1/4 inches, a weight of 2.27 #/Lft., and a length of 7 feet. Braces with major damage should be rejected.

The diagonal brace is fastened to the end, corner, or pull post by one of two methods. The two methods are the standard method and alternate method. Both methods are detailed on Standard Sheet 603-FFTF-01. The opposite end is placed within a Class A or B concrete anchor. This anchor is approximately 2 feet in length and 1 foot in diameter. This anchor is also detailed on Sheet 603-FFTF-01.

Diagonal Braces (cont'd)

Care should be taken during placement of the concrete anchors for end, corner, pull posts and the diagonal braces. If the concrete is allowed to take a "mushroom" shape, future damage may occur. A "mushroom" anchor allows the freezing and thawing action of the surrounding soil to lift the post or diagonal brace.
After several winters the post and braces are rendered inoperative. Therefore the upper limits of the concrete should not exceed the circumference of the drilled hole. No tension or strain should be placed on posts or braces until the concrete has cured 4 days.

Line Posts

Line posts in F.F.T.F. are the intermediate posts between end, corner, or pull posts. Their function is to give the fence fabric and barbed wires support and correct alignment. Line posts can be of two types:

* Studded "T" (weighing 1.33 #/Lft.)
* "U" (weighing 1.33 #/Lft.)

Line posts will :

* be galvanized.
* have an anchor plate.
* be spaced uniform as practicable.
* be driven to the required grade & alignment.
* be placed at each abrupt change in grade.
* be set on 16 foot centers.
* be set with a 2 foot spacing tolerance at special locations.

Occasionally special cases will arise and the project engineer may direct otherwise. For example: If an object, such as a tree, is located on the right-of-way and is to remain in place, the fence may be set off line enough to miss the object. Such a case requires a gradual offset for at least 3 posts in each direction to eliminate sharp bends.

Woven Wire Fabric

47 inch woven fence fabric for F.F.T.F. is a series of 10 horizontal line wires kept in alignment by vertical stays. Both the line wires and vertical stays are galvanized or aluminum coated No. 9 gauge wire. Two methods of securing the vertical stays are detailed on Standard Sheet 603-FFTF-01. The methods are "wrapped" and "welded". The wrapped type is the most commonly used.

Woven Wire Fabric (cont'd)

Placement of the fence fabric has several general factors to consider during the inspection procedure.

* The tension required to stretch the fabric is to be applied by mechanical fence stretchers.
* All slack should be removed before making permanent attachments elsewhere.
* Line wires are to be fastened to end, corner, or pull posts by wrapping the wires around the post and tying the wire back on itself with no less than 1 1/2 tightly wrapped twists.
* All splices in the fabric should be securely made with the best practice and the manufacturer's recommendations.
* The fabric is to be placed on the side of the post facing the pavement.
* The fabric is to be fastened to intermediate or line posts with at least 5 (five) wire ties.

Barbed Wire

Two strands of barbed wire are used with F.F.T.F. One

is placed below the fence fabrice. The other is placed above the fence fabric.

Barbed wire is composed of a No. 12 1/2 gauge galvanized or aluminum coated steel wire. The barbs are spaced at approximately five (5) inches and are 4 round, 14 gauge barbs. Barbed wire No. 15 1/2 gauge, high tensile strength line wires with No. 16 1/2 gauge barbs can be substituted. The barb points and spacing are the same as No. 12 1/2 barbed wire.

Placement of the barbed wire has several general factors to consider during the inspection procedure.

* The tension required to stretch the wire is to be applied with single wire stretchers.
* All slack should be removed before making permanent attachments elsewhere.
* Line wires are to be fastened to end, corner, or pull posts by wrapping the wire back on itself with no less than 1 1/2 tightly wrapped twists.
* All splices in the wire should be securely made with the best practice and the manufactures's recommendations.
* The barbed wire is to be placed on the side of the post facing the pavement.
* The top barbed wire is to be placed 2 inches above the fence fabric. The lower barbed wire is to be placed 1 1/2 inches to 2 inches below the fence fabric or 1 to 1 1/2 inches above the ground line.
* The barbed wires should be attached to each line post.

Barbed Wire (cont'd)

Additional barbed wire may be required at small stream crossings and ground depressions. The space below the fence fabric (F.F.T.F. or C.L.T.F.) should have barbed wire as shown on Standard Sheet 603-FFTF-03. If the installation would cause collecting drifts in the channel it should not be placed. The wires should be stretched taut between posts. They should also be fastened to the posts such that vertical movement is prevented.

Materials and Placement of C.L.T.F.

There are basically nine individual parts to C.L.T.F. Standard Sheet 603-CLTF-01 details the parts. They are:

End, corner, and pull posts
Nominal braces
Line posts
Truss rod
Woven wire fabric
Stretcher bar
Tension Wire
Concrete
Fasteners

End, corner, and pull posts are the same material as used for F.F.T.F. They are also placed the same as F.F.T.F. end, corner, and pull posts.
Line posts in C.L.T.F. are placed in concrete anchors in the same manner as end, corner, and pull posts. Therefore they are usually placed at the same time as these posts. The line post shall be

1 1/4" Tubular (weighting 2.27#/Lft.)

Line posts in C.L.T.F. will

* be galvanized.
* be set on 10 foot maximum centers.
* be spaced as uniform as practicable.
* be placed in concrete class A or B.
* be placed at the required grade and alignment.
* be placed at each abrupt change in grade.
* be fitted with a cap to exclude moisture.

The bracing for C.L.T.F. at end, corner, or pull post is much different than F.F.T.F. Bracing includes:

* The first line post
* A 1 1/4 " nominal brace
* A truss rod
* A turnbuckle with 4" of take up
* Necessary fittings

Materials & Placement of C.L.T.F. (cont'd)

The assembly of C.L.T.F. bracing is detailed on Standard Sheet 603-CLTF-01. The certified technician should inspect the bracing to be assured that it has been assembled correctly.

The truss rods, turnbuckles, and fittings should be:

* of good commercial quality steel, malleable iron, or wrought iron.
* galvanized.

Tension wire is used at the top and bottom of chain link fence. These wires should:

* be No. 7 gage spring coil or crimped steel.
* be zinc or aluminum coated.
* have a breaking load of 1950 lbs.

The certified technician should be aware of several placement procedures. The tension wires should:

* be placed prior to fence fabric.

* be stretched taut by single wire stretchers.
* be secured at the ends in a satisfactory manner.
* be secured to all posts.
* not be placed until the concrete anchors have cured four days.

The fence fabric used for C.L.T.F. is a series of bent wires woven together. This weaving creates a 2 inch mesh pattern. After the wires are weaved together they are twisted together at the top and bottom. The twisting creates a barbed finish to the top and bottom. This twisted finished edge of the fabric is called "selvage". This twisted and barbed finish is no longer used.

The chain link fence fabric should have the following qualities:

* A height of 48 inches (unless otherwise specified.)
* Be made of No. 9 gage wire
* Have a woven mesh of 2 inch.
* Be galvanized or aluminum coated (coated after weaving) or may be aluminum fabric.

Materials & Placement of C.L.T.F. (cont'd.)

Placement of the fence fabric has several general factors to consider during the inspection procedure.

* The fabric is attached to the terminal ends with a stretcher bar. This bar is flat and measures 3/16" x 3/4". The stretcher bar is threaded through the loops of the fabric. It is secured to the posts by means of clamps with bolts and nuts. The number of clamps are shown on Standard Sheet 603-CLFT-01.
* The fabric is stretched using mechanical fence stretchers.
* All slack should be removed before making permanent attachments elsewhere.
* The fabric is to be fastened to the line posts with ties or clips. The ties are to be spaced 12" center to center. Therefore 5 ties would be required on 48" fabric.
* The fabric is to be fastened to the tension wires with ties. These ties are normally hog rings. They should be made of aluminum wire. Galvanized steel wire ties can be used. These must be no smaller than No. 12 gage. All ties should be spaced 24" center to center along the tension wires.
* Fence fabric should be placed 3″ above the ground level and 3″ below the top of the posts.

Gates

Gates used in fence are detailed on Standard Sheet 603-CLFT-03. Gates may be single or double swing. Single gates may be as wide as 32'. Double swing gates may be as wide as 64′. The width of the gate opening

determines the diameter size of the gate post. Gate post sizes are shown on a table in Sec 910.18(d) of the Standard Specifications.

The materials that make up a gate are as follows:

* Galvanized gate post
* Galvanized 1 1/2 " nominal gate frame with weld joint, riveted construction, or malleable fittings
* 3/8 " round truss rod
* Stretcher bar with fittings
* Galvanized standard hinge
* Galvanized standard lock
* Fence fabric

Measurements

Fence and resetting fence is measured by the linear foot. Measurement should be along the top of the fence. Begin measurement from the outside of an end post. Continue measurement to the outside of another end post. Measurements should be to the nearest 0.5 foot. Measurements should be recorded in a systematic method and retained for the final record. The certified technician should consult with the project engineer concerning a preferred systematic method.

Gates are paid for as each as set out in the itemized proposal.

Material Acceptance

Fencing materials are inspected by the INDOT testing department. Once inspections are complete, tags with "seal " numbers are attached to the materials. Rolls of fence fabric, barbed wire, and tension wire will have tags on each roll. Groups of individual items may have only one seal number. For example; a bundle of 100 "T" posts will have one number. Miscellaneous materials and gates are visually accepted.

The seal numbers indicate to the certified technician that the materials have been tested and are acceptable to use. This of course is assuming the materials have not been damaged during shipment or placement. Damaged material should not be used or corrected before used. Seal numbers should be recorded and passed on to the project engineer.